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EXAMINER	
BAND, MICHAEL A	

ART UNIT	PAPER NUMBER
1795	

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12/12/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/820,896	NEWCOMB ET AL.	
	Examiner	Art Unit	
	Michael Band	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 September 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,5-13 and 15-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-13 and 15-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 September 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 3, 5, 9-10, and 12-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Wurczinger (USPGPub 2005/0178662).

With respect to claims 1 and 13, Wurczinger discloses a system for coating a substrate (p. 1, para 2) comprising a vacuum chamber (p. 1, para 0019; fig. 2, [1]), a rotatable tube positioned inside the vacuum chamber (fig. 2, [1]-[2]; p. 1, para 0017), a shaft connect to the rotatable tube (fig. 3, [2]-[3]); a bearing positioned outside the vacuum chamber (fig. 2, [16]-[17]); a seal (fig. 2, [13]) positioned between the bearing (fig. 2, [16]) and the vacuum chamber (fig. 2, [1]); and a power coupler configured to deliver power to rotatable tube (p. 1, para 0017-0018), the power coupler (fig. 2, [9], [23]), with a current limiter [23], positioned between the bearings (fig. 2, [17]) and the seal (fig. 2, [13]).

With respect to claim 3, Wurczinger further discloses the system comprising the rotatable tube and shaft are integrated (fig. 1, [2]-[3]).

With respect to claim 5, Wurczinger further discloses the system comprising a drive system (fig. 2, [18]) configured to rotate the shaft (fig. 2, [3]) (p. 1, para 0017).

With respect to claim 9, Wurczinger further discloses the system wherein the power coupler is positioned outside the vacuum chamber (fig. 2, [1], [9]).

With respect to claim 10, Wurczinger further discloses the system wherein the power coupler comprises a water-cooled slip (fig. 2, [9], [23]; fig. 3, [4]). Wurczinger further depicts fig. 3 having an inner body [25] of the target tube with cooling conduit inflow [4] and outflow [5] running through the inner body according to fig. 4.

With respect to claim 12, Wurczinger further discloses the system comprising a support positioned inside the vacuum chamber, wherein the rotatable tube is continually supported by the support (fig. 3, [1]-[2], [10], [39]; p. 2, para 0020). Wurczinger further depicts fig. 3 having an inner body [25] of the target tube with cooling conduit inflow [4] and outflow [5] running through the inner body according to fig. 4.

3. Claim 19 is rejected under 35 U.S.C. 102(b) as being anticipated by Toki (Japanese Patent No. 01305523).

With respect to claim 19, Toki teaches a bearing for pivoting an electrode (i.e. cathode/target) rotating in vacuum to provide conduction of high frequency power supply to the electrode (i.e. cathode/target) (abstract). Toki also discusses an electrically conductive liquid used as a connection terminal between the electrode (i.e. cathode/target) for the high frequency power (abstract). Toki further states that mercury is used to electrically connect the electrode and the case, thus making the mercury a liquid-metal connector. Furthermore Toki teaches the mercury (i.e. liquid-metal) connector is filled in the bearing case (i.e. shaft) that contains a bearing for pivoting an electrode (i.e. cathode/target) rotating (i.e. rotatable tube) (abstract). Mercury has a

known resistivity of approximately $9.58x10^{\wedge-7}\Omega m$. Therefore, the mercury will automatically limit the current at a certain point due to inherent properties.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 2, 6, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wurczinger (USPGPub 2005/0178662) as applied to claims 1 and 13 above, and further in view of Barret (US Patent No. 6,736,948).

With respect to claims 2 and 15, the reference is cited as discussed for claims 1 and 13. However Wurczinger is limited in that while it does disclose transferring power into and out of the vacuum chamber and through the cathode [2] (p. 1, para 0018), it

does not state whether a power coupler is placed outside or inside the vacuum chamber.

Barrett teaches a cylindrical magnetron for sputter deposition with a drive system designed to operate with a high capacity electrical transfer system (abstract; col. 3, lines 52-57). Barrett further teaches transferring electrical power to and from a rotating target at the high levels required (col. 2, lines 14-16). In order to sputter effectively the targets must be in a vacuum environment as is well known in the art and exemplified in Barrett (col. 11, lines 32-34). Therefore the power coupler is inside the vacuum chamber. By transferring the electrical power within the device to rotating components, the undesirable effects of heat generation are better controlled and minimized at dynamic locations (col. 4, lines 6-9).

It would have been obvious to one of ordinary skill in the art to place the power coupler inside the vacuum chamber as taught in Barrett for the apparatus in Wurczinger in order to gain the advantages of increased control and minimization of negative heat generation characteristics and one of ordinary skill would have a reasonable expectation of success in making such a modification.

With respect to claim 6, Wurczinger is limited in that while it discloses using bearings on the shaft (fig. 2, [3], [16]-[17]; fig. 1, [3]), it does not describe the composition of the bearings.

Barrett further teaches a cylindrical magnetron for sputter deposition with a drive system designed to operate with a high capacity electrical transfer system (abstract; col. 3, lines 52-57). Barrett also teaches a bearing (part 334) being "a full ceramic bearing"

(col. 8, line 33) since "ceramic material has the advantage of being non-conductive, which means it will not heat up due to AC induction resulting from the current flow" (col. 8, lines 34-36).

It would have been obvious to one of ordinary skill in the art to compose the bearings of ceramic material taught in Barrett for the bearings in Wurczinger in order to gain the advantages of imperviousness to heat due to electrical conduction from current flow and one of ordinary skill would have a reasonable expectation of success in making such a modification.

7. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wurczinger (USPGPub 2005/0178662) as applied to claim 1 above, and further in view of Needham (US Patent No. 4,115,283).

With respect to claim 7, the reference is cited as discussed for claim 1. However Wurczinger is limited in that while it discusses using bearings on the shaft, it does not disclose the bearings being comprised specifically of ceramic needles.

Needham '283 teaches bearings known for antifriction composition (i.e. will not heat due to electrical conduction) (abstract). In addition to being composed of a variety of metallic materials, the bearings comprise about 15 to 25 weight percent of ceramic fibers (i.e. needles) (col. 1, lines 56-64). Needham '283 further states that these compositions are useful in a variety of applications such as journal bearings, bushings, ball bearing cages, and a variety of fittings, washers, seals, seats, wear rings, and the like (col. 4, lines 48-52). Ceramic material is also well known to be impartial to heating effects.

It would have been obvious to one of ordinary skill in the art to use ceramic fibers taught in Needham '283 as part of the bearing composition in Wurczinger in order to gain the advantage of imperviousness to heat and friction.

8. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wurczinger (USPGPub 2005/0178662) as applied to claim 1 above, and further in view of Tanaka (UK Patent Application No. 2,290,305).

With respect to claim 8, the reference is cited as discussed for claim 1. However Wurczinger is limited in that while it discusses using bearings on a shaft for a cylindrical magnetron (abstract; fig. 2, [3], [16]-[17]; fig. 1, [3]), it does not disclose the type of composition for the metal or metallic material bearing.

Tanaka '305 teaches a bearing alloy for use in oxidizing atmosphere, high-temperature applications (p. 1, lines 3-5). Tanaka '305 further teaches the alloy to be composed of, by weight, about 9 to 30% chromium, 2 to 22% cobalt, 1.4 to 11% molybdenum, and nickel composing a significant portion of the remaining alloy matrix (p. 1, 18-20; Table 1; Table 2). Tanaka '305 further discusses that a feature of the invention is " a combination of a bearing and a shaft, in which the bearing is formed of the bearing alloy" (p. 5, lines 5-7). Tanaka '305 discusses the advantages of using this alloy as excellent oxidation resistance and wear resistance while decreasing wear loss of the shaft for high-temperature applications (p. 5, lines 21-25).

It would have been obvious to one of ordinary skill in the art to use the bearing alloy taught in Tanaka '305 for the bearings in Wurczinger in order to gain the

advantages of excellent oxidation resistance and wear resistance while decreasing wear loss of the shaft for high-temperature applications.

9. Claims 11, 16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wurczinger (USPGPub 2005/0178662) and further in view of Toki (Japanese Patent No. 01305523).

With respect to claim 11, the reference is cited as discussed for claim 1. However Wurczinger is limited in that while it discusses a power coupler used to transfer power into and out of the vacuum chamber (p. 1, para 0018), it does not tell whether the power coupler is comprised of a liquid-metal connector.

Toki teaches supplying a high frequency power to electrodes (i.e. target), by a structure wherein a bearing case, which supports an electrode (i.e. cathode/target) to be rotated (i.e. cylindrical magnetron) in a vacuum vessel (abstract). An electrically conductive liquid is used as a connection terminal between the electrode (i.e. cathode/target) for the high frequency power (abstract). Toki further teaches that mercury is used to electrically connect the electrode and the case, thus making the mercury a liquid-metal connector. The advantage to using a mercury connector is power can be supplied to the electrode without being affected by abrasion of the bearing mechanism (abstract).

It would have been obvious to one of ordinary skill in the art to use the mercury connector taught in Toki as the power coupler in Wurczinger in order to gain the advantage of decreased resistivity, and thus decrease in loss of power, between the

bearing and the cathode and one of ordinary skill in the art would have a reasonable expectation of success in making such a modification.

With respect to claim 16, Wurczinger '662 further discloses a system for coating a substrate (p. 1, para 0002) comprising a vacuum chamber (p. 1, para 0019; fig. 2, [1]), a rotatable tube positioned inside the vacuum chamber (fig. 2, [1]-[2]; p. 1, para 17), a shaft connected to the rotatable tube (fig. 3, [2]-[3]); a bearing positioned outside the vacuum chamber (fig. 2, [16]-[17]); a seal (fig. 2, [13]) positioned between the bearing (fig. 2, [16]) and the vacuum chamber (fig. 2, [1]); and a power coupler configured to deliver power to rotatable tube (p. 1, para 0017-0018), the power coupler (fig. 2, [9], [23]), with a current limiter [23], positioned between the bearings (fig. 2, [17]) and the seal (fig. 2, [13]).

However Wurczinger is limited in that while it discusses a power coupler used to transfer power into and out of the vacuum chamber (p. 1, para 0018), it does not tell whether the power coupler is comprised of a liquid-metal connector.

Toki further teaches supplying a high frequency power to electrodes (i.e. target), by a structure wherein a bearing case, which supports an electrode (i.e. cathode/target) to be rotated (i.e. rotatable tube) in a vacuum vessel (abstract). An electrically conductive liquid is used as a connection terminal between the electrode (i.e. cathode/target) for the high frequency power (abstract). Toki further teaches that mercury is used to electrically connect the electrode and the case, thus making the mercury a liquid-metal connector. The advantage to using a mercury connector is power

can be supplied to the electrode without being affected by abrasion of the bearing mechanism (i.e. shaft) (abstract).

It would have been obvious to one of ordinary skill in the art to use the mercury connector taught in Toki as the power coupler in Wurczinger in order to gain the advantage of decreased resistivity, and thus loss of power, between the bearing and the cathode and one of ordinary skill in the art would have a reasonable expectation of success in making such a modification.

With respect to claim 18, Toki further teaches the mercury (i.e. liquid-metal) connector is filled in the bearing case (i.e. shaft) that contains a bearing for pivoting an electrode rotating (i.e. rotatable tube) (abstract).

10. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wurczinger (USPGPub 2005/0178662) and Toki (Japanese Patent No. 01305523) as applied to claim 16 above, and further in view of Barret (US Patent No. 6,736,948).

With respect to claim 17, the references are cited as discussed for claim 16. However Wurczinger and Toki are limited in that while both discuss using a bearing to connect the shaft to the vacuum and to provide rotation (Wurczinger; fig. 2, [16]-[17]; p. 1, para 0018) (Toki; abstract), neither discusses the composition of the bearing.

Barrett further teaches a cylindrical magnetron for sputter deposition with a drive system designed to operate with a high capacity electrical transfer system (abstract; col. 3, lines 52-57). Barrett also teaches a bearing (part 334) being "a full ceramic bearing" (col. 8, line 33) since "ceramic material has the advantage of being non-conductive,

which means it will not heat up due to AC induction resulting from the current flow" (col. 8, lines 34-36). Ceramic is well known to be an inorganic, non-metallic material.

It would have been obvious to one of ordinary skill in the art to compose the bearings of ceramic material taught in Barrett for the bearings in modified Wurczinger in order to gain the advantages of imperviousness to heat due to electrical conduction from current flow.

Response to Arguments

Objections

11. With respect to the drawing objections, the Applicant has submitted replacement drawings properly labeled. Therefore the objection is withdrawn.

12. With respect to the trademark objection, the Examiner agrees with the Applicant's comments that the "liquid-metal" present in the application represents liquid metal generically. Therefore the objection is withdrawn.

102 Rejections

13. Applicant's arguments filed September 26, 2007 have been fully considered but they are not persuasive.

14. On pages 8-9 and 11, the Applicant argues that a rotary drive unit [18] is not a power coupling. Furthermore, the Applicant argues that the voltage source [9] and current feed [23] do not encompass a power coupler between a bearing and a seal.

The Examiner agrees that the rotary drive unit [18] is not a power coupler. However the Examiner submits that a typographical error was present in the previous Office Action, with part [18] supposed to be parts [9] and [23]. This is further supported by the fact that part [18] is not present in para [0017]-[0018] as indicated by the previous Office Action. The Examiner does respectfully disagree that the voltage source [9] and current feed [23] do not form an arrangement of a power coupler. As seen in fig. 2, the voltage source feeds the current through part [23], which is between a bearing [17] and a seal [13], as stated in the previous Office Action.

15. On page 10, the Applicant argues that the reference does not teach a water-cooled slip ring connector, nor does the reference teach a power coupler comprising a water-cooled slip connector.

The Examiner respectfully disagrees. As stated, the reference discloses a "system wherein the power coupler comprises a water-cooled slip (fig. 2, [9], [23]; fig. 3, [4])". Fig. 4 depicts an inner body [25] of the target tube with cooling conduit inflow [4] and outflow [5] running through the inner body. Since the voltage runs through the cathode (i.e. target) (p. 1, para 0018), the target also comprises part of the power coupler. Thus a water cooled ring [4] cools the power coupling.

103 Rejections

16. On pages 11-12, the Applicant argues that the liquid-metal connector will not limit the current through the bearing, pointing out that inherent properties of mercury.

The Examiner respectfully disagrees. As stated in the reference Toki, the liquid mercury is placed inside the bearing casing, thus the liquid mercury is between the bearing, as a whole, and a rotatable target. As also stated in the previous Office Action, mercury has a well known resistivity which will automatically limit the amount of current that flows through the bearing as claimed, regardless of certain areas that may be a different material (i.e. ceramic or steel) and lead to differing resistivities.

17. On page 13-14, the Applicant argues that the references Barrett and Wurczinger cannot be combined since the bearing of Barrett does not conduct electricity.

The Examiner respectfully disagrees. All materials exhibit some type of conductivity depending on specific conditions. Conductive ceramics are known to be employed as resistors and electrode, as evidenced by *Encyclopaedia Britannica Online*.

18. On page 14, the Applicant argues that the reference Needham does not teach ceramic needles.

The Examiner respectfully disagrees. As pointed out by the Applicant, Needham discusses ceramic fibers which may be used in bearings. Fibers and needles are both slender, elongated items of relatively small size. Furthermore, there is no support in the examined specification for the invention encompassing ceramic needles.

19. On page 15, the Applicant argues that the reference Toki does not teach a liquid-metal connector between the bearing and rotatable shaft. In addition, the reference Wurczinger does not teach positioning a power coupler between the bearing and rotatable shaft.

The Examiner respectfully disagrees. As stated in the reference Toki, the liquid mercury is placed inside the bearing casing, thus the liquid mercury is between the bearing, as a whole, and a rotatable target (i.e. shaft or tube). As also stated in the previous Office Action, mercury has a well known resistivity which will automatically limit the amount of current that flows through the bearing as claimed, regardless of certain areas that may be a different material (i.e. ceramic or steel) and lead to differing resistivities. Wurczinger depicts in fig. 2 the voltage source [9] and current feed [23] do not form an arrangement of a power coupler. As also seen in fig. 2, the voltage source feeds the current through part [23], which is between a bearing [17] and a rotatable cathode tube (i.e. shaft) [2].

Conclusion

20. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Band whose telephone number is (571) 272-9815. The examiner can normally be reached on Mon-Fri, 8am-4pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

22. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MAB

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